STATE OF CALIFORNIA
The Resources Agency
Department of Water Resources

BULLETIN No. 105-4

WATER MANAGEMENT FOR WILDLIFE ENHANCEMENT IN BUTTE VALLEY

NOVEMBER 1973

NORMAN B. LIVERMORE, JR.
Secretary for Resources
The Resources Agency

RONALD REAGAN
Governor
State of California

JOHN R. TEERINK
Director
Department of Water Resources

STATE OF CALIFORNIA

The Resources Agency

Department of Water Resources

BULLETIN No. 105-4

WATER MANAGEMENT FOR WILDLIFE ENHANCEMENT IN BUTTE VALLEY

Copies of this bulletin at $2.00 each may be ordered from:

State of California
DEPARTMENT OF WATER RESOURCES
P.O. Box 388
Sacramento, California 95802

Make checks payable to STATE OF CALIFORNIA.
California residents add 5 percent sales tax.

NOVEMBER 1973

NORMAN B. LIVERMORE, JR.
Secretary for Resources
The Resources Agency

RONALD REAGAN
Governor
State of California

JOHN R. TEERINK
Director
Department of Water Resources

FOREWORD

An 18,000-acre parcel of presently semibarren land in Siskiyou County has the potential of becoming one of the better wildlife management areas in California. The land is in Butte Valley near the California-Oregon border, in the midst of the Pacific Waterfowl Flyway. Except for seasonal cattle grazing, the land is mostly unused, primarily because of poor soils and an undeveloped water supply.

In February 1972, the Department of Water Resources initiated a study of Butte Valley to evaluate water needs and water problems. Early in the study, the Department found that available water supplies are adequate to meet the area's present water needs and that future water demands can probably be met from expanded use of ground water pumping.

Further investigation revealed that federally owned land in the center of the valley offers an attractive possibility for development as a wildlife management area. With support from local landowners, sportsmen's groups, the State Department of Fish and Game, and the U. S. Forest Service, the Department of Water Resources conducted an investigation of a wetland wildlife enhancement project in Butte Valley.

This bulletin presents the results of a 1-year planning study which concluded that the project land could be converted into a wildlife management area, that a water supply could be developed to serve the area, and that such a project would produce substantial wildlife benefits at reasonable costs. An appendix to this report containing technical data on the wildlife plan, ground water geology, design and cost estimates, soils, and water quality is published as a separate document and is available upon request.

Further action toward development of the Butte Valley wildlife management area will depend upon the amount of public support expressed for the project.

John R. Teerink

John R. Teerink, Director
Department of Water Resources
The Resources Agency
September 7, 1973

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

RONALD REAGAN, Governor
NORMAN B. LIVERMORE, JR., Secretary for Resources, The Resources Agency
JOHN R. TEERINK, Director, Department of Water Resources

NORTHERN DISTRICT

Albert J. Dolcini . . . . . District Engineer
George R. Baumli . . . . . Chief, Planning Branch

This bulletin was prepared under the direction of

Edwin J. Barnes . . . . . Chief, Environmental Studies Section

by

Douglas N. Denton . . . . . Assistant Engineer

Special services were provided by

Robert F. Clawson . . . . . Senior Engineer
Philip J. Lorens . . . . . Senior Engineering Geologist
Robert R. McGill . . . . . Senior Land and Water Use Analyst
Walter L. Quincy . . . . . Senior Economist
Donald S. Slebodnick . . . . . Associate Engineer
Thomas B. Stone . . . . . Associate Wildlife Manager-Biologist
Edward A. Pearson . . . . . Research Writer
Clifford D. Maxwell . . . . . Senior Delineator
James F. Barnes . . . . . Engineering Aid II

Photograph credits

California Department of Fish and Game -- Pages 6, 10, 11, 40 top
Bureau of Sport Fisheries and Wildlife -- Pages vi, 40 bottom

Cover sketch

Nancy Serr

****

CALIFORNIA WATER COMMISSION

IRA J. CHRISMAN, Chairman, Visalia
CLAIR A. HILL, Vice Chairman, Redding

Mal Coombs, Garberville
Ray W. Ferguson, Ontario
William H. Jennings, La Mesa
Clare Wm. Jones, Firebaugh
William P. Moses, San Pablo
Samuel B. Nelson, Northridge
Ernest R. Nichols, Ventura

Orville L. Abbott, Executive Officer and Engineer
Tom Y. Fujimoto, Staff Assistant

CONTENTS

FIGURES

TABLES

APPENDIXES

Separately published appendixes present technical data on the wildlife plan, ground water geology, design and cost estimates, water supply and soils, and water quality.

CHAPTER I. SUMMARY

ien settlers first came to what is
w California they were no doubt awed
r the variety and numbers of wildlife
ey saw. Marshes and other wetlands
r waterfowl probably appeared end-
ss and the possibility that the
mber of ducks and geese would ever
severely reduced must have seemed
mote. Yet, many wildlife species
ve experienced severe declines in
mbers since those early days, and
e once seemingly endless marshlands
ve been reduced to a small fraction
the area they once occupied.

lthough some decline is probably in-
itable when a technological society
croaches on territory which was
eviously used exclusively by wild-
ife, man, in many instances, has gone
o far in reclaiming land to make it
abitable for people and thus unin-
abitable for native wildlife. Many
eople are beginning to realize that
e standard of living they have worked
hard to attain is being paid for by
decrease in the quality of life which
s greater than many are willing to
ccept. Most Americans today live in
n urban environment of concrete and
teel, where nature has been almost
ompletely obscured and replaced by
he artificial. As a result, the de-
and for contact with nature has
reatly increased at a time when the
pportunities for it are declining.

n California, which is the main win-
ering ground for waterfowl in the
acific Flyway, marsh habitat has dwin-
led from an estimated 5 million acres
n the early 1800s to 3.5 million
cres at the turn of the century to
bout 400,000 acres presently. By
980 wetlands will be further reduced
y an estimated 15 percent to 340,000
cres. While the wetlands have con-
inued to decline at this alarming
ate, the demand for waterfowl hunting, and nonhunting activities such as bird-watching, photography, and sightseeing, has continued to increase. It is quite evident that the continual loss of living space for wildlife, and public lands which can be used by hunters, are major problems facing wildlife management agencies.

Hunting opportunities are decreasing each year due to urban encroachment, land closures, and increasing numbers of hunters. By opening day of the 1971 waterfowl season in California, the Department of Fish and Game had received 20 applications for every available reservation on state and federally operated wildlife refuges. Approximately 28,000 hunters made application for 1,400 possible reservations. It is not unusual for 300 or more hunters to arrive at a wildlife area on Friday afternoon and wait overnight in their cars in hopes that reservation-holders will fail to show up, thereby allowing them an opportunity to hunt. It is evident to most people who have hunted on these areas that the demand for hunting greatly exceeds the supply. Therefore, when an opportunity arises to enhance wildlife resources and increase hunting opportunities at a reasonable cost without taking land out of agricultural production or using water needed for other purposes, the possibility should receive serious consideration. Such an opportunity exists in Butte Valley.

Origin of Study

After an information meeting with water interests in Butte Valley, this investigation began as an overall basin study considering flood control, water conservation, and water-associated recreation needs. However an initial reconnaissance study of the area and

review of available literature revealed that a considerable amount of study by other agencies had already been performed. In 1960 the U. S. Bureau of Reclamation formulated preliminary plans for importing Klamath River water into the Butte Valley Area. This study was updated in 1971. In the spring of 1965 the U. S. Corps of Engineers constructed a drain leading from Meiss Lake into the Klamath River to provide flood control and drainage. The State Division of Soil Conservation also performed a study in 1965 which resulted in construction of two flood control diversions on Butte Creek.

After an initial review of existing literature concerning water development in Butte Valley, and a limited amount of field investigation, it was concluded that no new studies of projects to develop either additional flood control or agricultural water supplies were needed at this time. However, the possibility of developing a water supply for the federally owned land in the center of Butte Valley and converting it into a wildlife management area had not been considered previously and appeared worthy of study.

Early in the study, the Department established coordination with the U. S. Forest Service, State Department of Fish and Game, and U. S. Soil Conservation Service. The Forest Service and Fish and Game have since played an important role in helping develop the wildlife management plan.

The Forest Service, which manages the federal land, was receptive to the idea of studying the potential of this land for a wildlife management area. In February 1972, the Forest Service conducted a public meeting on the proposed study at Macdoel in Butte Valley. Representatives of several federal, state, and local agencies attended. The consensus was that such a study should be undertaken and that a wildlife management area in Butte Valley would be highly beneficial to the area and compatible with the use of the surrounding lands.

Developing plans involving the use of water strictly for wildlife enhancement is a new area of activity for the Department of Water Resources. However, this type of planning is authorized by the California Water Code which requires that full consideration be given to the preservation and enhancement of fish and wildlife in water resources planning. In fulfilling its responsibilities, the Department is modifying some programs and initiating others in response to increasing public concern for the environment.

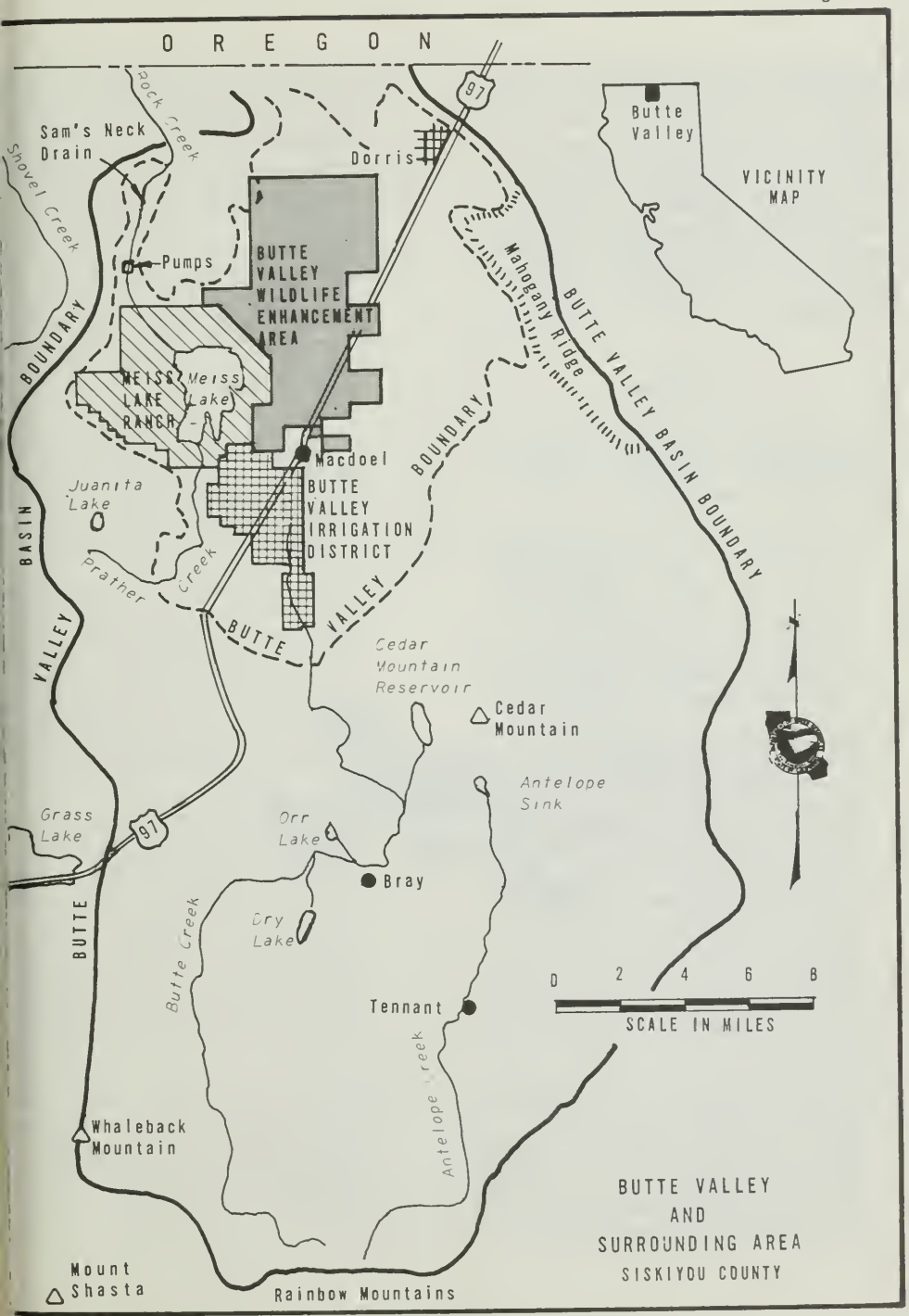
The Wildlife Project

The Butte Valley wildlife area would be located on an 18,000-acre parcel of federally owned land in the center of Butte Valley, Siskiyou County (Figure This nearly barren area could be converted into a wildlife enhancement area comparable in many ways to the famous Tule Lake-Lower Klamath National Wildlife Refuges located 15 to 25 miles to the east. The major improvements needed to develop this land into a wildlife management area are a water supply, ponds for marsh areas, and planting of suitable cover and crops to provide attraction, food, nesting and resting habitat.

Water can be obtained from the underlying ground water basin and from floodwaters of nearby Meiss Lake. Suitable ponds and marshes can be developed on the extremely flat land of the area. Cereal grains and other waterfowl food crops can be grown on the proposed wildlife area.

Meiss Lake, adjacent to the proposed wildlife area, provides an example of the kinds of wildlife that would be attacted by the project. This 4,000-acre lake provides nesting and

Figure 1


OREGON
Sam's Neck Drain
Rock Creek
Shovel Creek
Dorris
97
Pumps
BUTTE VALLEY WILDLIFE ENHANCEMENT AREA
WEISS LAKE RANCH
Weiss Lake
BOUNDARY
Macdoel
Juanita Lake
BUTTE VALLEY IRRIGATION DISTRICT
Prather Creek
BUTTE VALLEY BASIN
Cedar Mountain Reservoir
Cedar Mountain
Antelope Sink
Grass Lake
Orr Lake
Bray
Dry Lake
Butte Creek
Tennant
Antelope Creek
Whaleback Mountain
Mount Shasta
Rainbow Mountains
Mahogany Ridge
BUTTE VALLEY BASIN BOUNDARY
Butte Valley
VICINITY MAP
0 2 4 6 8
SCALE IN MILES
BUTTE VALLEY AND SURROUNDING AREA
SISKIYOU COUNTY

feeding habitat for many types of ducks, including mallard, pintail, and gadwall. Canadian geese live on the lake almost the year around, and snow geese are found in large numbers during their migrations. Also, grebes, gulls, terns, and occasionally greater sandhill cranes nest on or near the lake, and several varieties of hawks and eagles live nearby. All of these wildlife species would benefit from a wildlife enhancement project in Butte Valley.

Conclusions

As a result of this study, the following conclusions have been formulated regarding the proposed Butte Valley wildlife enhancement area.

1. California's wetlands are rapidly disappearing. Less than 12 percent of the marsh habitat available at the turn of the century remains today. Wetland areas will continue to decline unless the draining of ponds and marshes for land development is stopped.

2. The demand for public waterfowl and upland game hunting far exceeds the available supply. Applications to hunt on state and federal wildlife areas exceed permits issued by more than 20 to 1 during the opening weekend of duck and pheasant seasons. The demand for hunting continues to increase while the number of available hunting areas is rapidly declining. Opportunities for acquiring additional wetlands dedicated to preservation of wildlife habitat are scarce.

3. An 18,000-acre parcel of land suitable for wildlife enhancement exists in public ownership in Butte Valley, Siskiyou County. This land, which is managed by the U. S. Forest Service could be converted into a major wildlife management area.

4. The wildlife enhancement area could supply sufficient food for 7 million duck-days of use. It could accommodate nesting levels sufficient for the annual propagation of 6,500 ducks, 750 geese, and 3,000 pheasants, and provide 18,000 hunter days, 2,000 fisherman days, and 11,000 nonconsumptive days of use. The area would also support substantial numbers of rabbits, shorebirds, raptors, songbirds, and rare wildlife species such as bald eagles and greater sandhill cranes.

5. A sufficient water supply to meet projected future water demands of the Butte Valley wildlife enhancement area is available from ground water development and from utilization of Meiss Lake overflow.

6. The use of water for the wildlife enhancement area would occur primarily in the nonirrigation season to avoid significant adverse effects on the agricultural water supply in Butte Valley. The enhancement project would reduce the amount of poor quality floodwater pumped from Meiss Lake to the Klamath River.

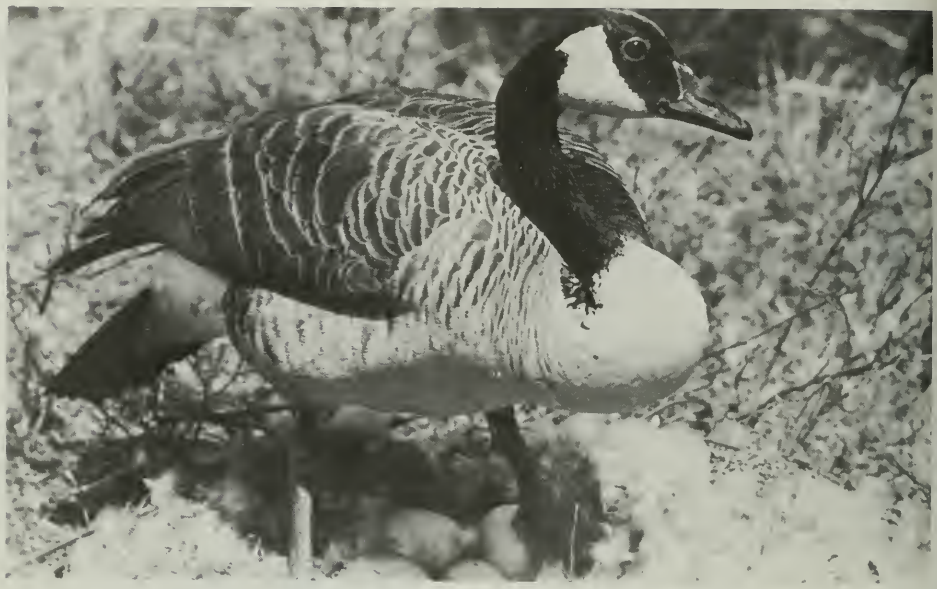
7. The economy of Butte Valley is supported mainly by agriculture. Present agricultural water use is approximately 82,000 acre-feet per year with the demand expected to grow to about 94,000 acre-feet per year by 1990. Preliminary study indicates that sufficient additional supplies can be obtained from the ground water basin to meet these needs and the demands of the wildlife area.

8. The estimated capital cost of the Butte Valley wildlife enhancement area is $1,900,000; estimated annual cost for operation, maintenance, and replacement is $180,000.

The U. S. Forest Service would be the logical agency to manage the wildlife enhancement area. Other possible management agencies are the U. S. Bureau of Sport Fisheries and Wildlife or the Department of Fish and Game.

Feasibility studies are required to further define costs, accomplishments and funding sources for the wildlife enhancement area.

11. Action leading to construction of the Butte Valley wildlife management area will probably come about only through support of a concerned citizenry led by active sportsmen's and wildlife conservation groups.



CHAPTER II. STUDY AREA FEATURES AND DEVELOPMENT

The Butte Valley Basin study area is bounded on the north by the California-Oregon border and on the south by the McCloud River-Butte Creek drainage divide. Mahogany Ridge, which separates Butte Valley from Lower Klamath Lake, forms the eastern boundary. The Cascade Mountains to the west separate Butte and Shasta Valleys. The valley portion of the basin occupies approximately 120 square miles of level land at an elevation averaging about 4,250 feet. Most of the remainder of the 616-square-mile basin lies south of the valley. Much of this upper basin topography is rough surfaced and of moderate to steep slope. Elevations rise to a little over 7,000 feet at the southern drainage divide. Butte Valley and the basin boundaries are shown in Figure 1.

Study efforts were concentrated mainly in Butte Valley and specifically in the 18,000-acre Federal Land Use Project (LUP) area in the center of the valley. The entire Butte Valley Basin is considered because it is the source of water to the valley and the LUP area. Future water development in the basin will affect the amount of water available to the valley. The higher elevation lands of the Butte Valley Basin contribute most of the water to Butte and Antelope Creeks, which in turn supply most of the water to the valley.

The Butte Valley Basin is composed of volcanic formations characterized by numerous cinder cones and lava flows. Cinder cones, such as Bald Mountain, Sheep Mountain, Cedar Mountain, Orr Mountain, and Mahogany Ridge, are easily seen landmarks dotting the basin. Butte Valley is a large volcanic structural depression which over the years has filled in with volcanic ash and lake deposits. From the air, Meiss Lake is the most prominent feature. The lake lies on the western edge of the valley and serves as the sump for runoff originating in the western part of the basin and return flows from irrigation of surrounding lands.

Population and Transportation

The population of the study area is approximately 2,000 with about half the people living in or around the town of Dorris. The small farming communities of Macdoel and Mt. Hebron are located in the southern portion of Butte Valley, and the old lumber town of Tennant is located in the southern portion of the basin. These three communities combined contain fewer than 500 people. Transportation into Butte Valley is provided by two-lane State Highway 97 and by the Southern Pacific Railroad. Most other roads in the basin are two-lane gravel or cinder roads and many of them cannot be reliably traveled during the winter.

Climate

The climate of the Butte Valley Basin is characterized by cold, wet winters and warm, dry summers. Annual precipitation averages 12 inches on the valley floor and increases to over 30 inches along the southern and western basin boundaries as shown in Figure 2. Winter snow is common and usually melts off slowly. Maximum and minimum temperature extremes (Figure 3) range from 100 degrees in the summer to 20 degrees below zero during unusually cold winters. Mean temperatures range from 28 degrees in January to 63 degrees in July and August. Frost can occur almost any month of the year in this area. The growing season is considered to be approximately 100 days.

Figure 2

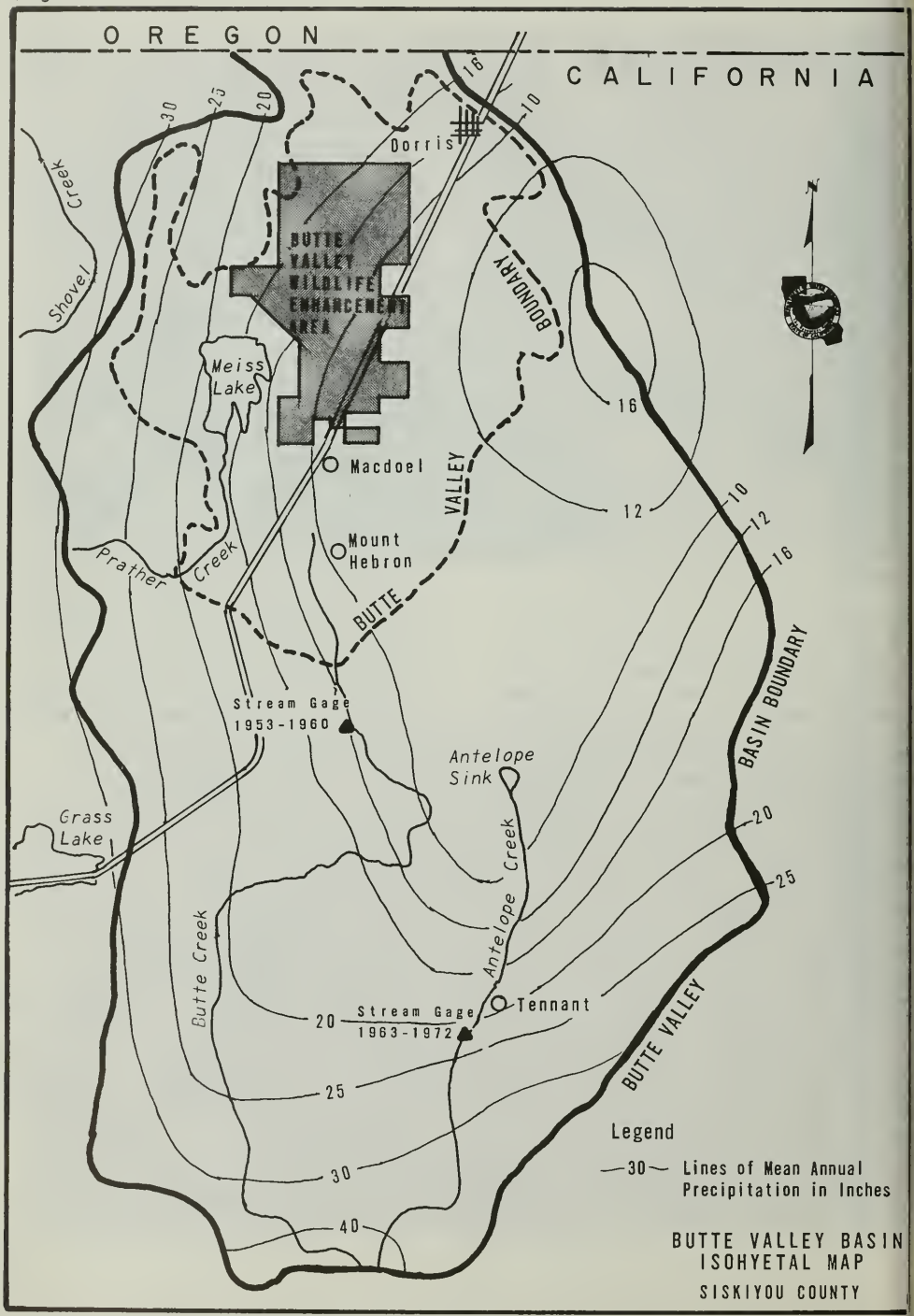
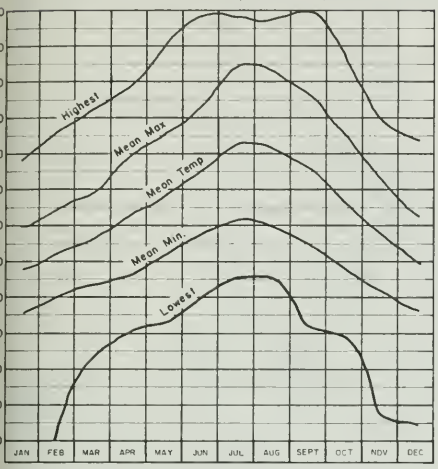

OREGON
CALIFORNIA
Dorris
Shovel Creek
BUTTE VALLEY WILDLIFE ENHANCEMENT AREA
Meiss Lake
Macdoel
Mount Hebron
Prather Creek
BUTTE VALLEY BOUNDARY
BASIN BOUNDARY
Stream Gage 1953-1960
Antelope Sink
Grass Lake
Butte Creek
Antelope Creek
Stream Gage 1963-1972
Tennant
BUTTE VALLEY
16
10
30
25
20
12
40
Legend
—30— Lines of Mean Annual Precipitation in Inches
BUTTE VALLEY BASIN
ISOHYETAL MAP
SISKIYOU COUNTY

Figure 3

AIR TEMPERATURES AT THE MOUNT HEBRON RANGER STATION (1954-1964)



Development

Settlement of Butte Valley began shortly after the California Gold Rush, and the population continued to increase slowly until the early 1900s. Many people tried homesteading this area during the early years of development but the short, uncertain growing seasons, coupled with poor soils in some areas and lack of readily available surface water supplies, spelled failure for most of the early settlers. This is evidenced by the many old farm buildings, fences, and windmills still standing in various areas throughout the valley.

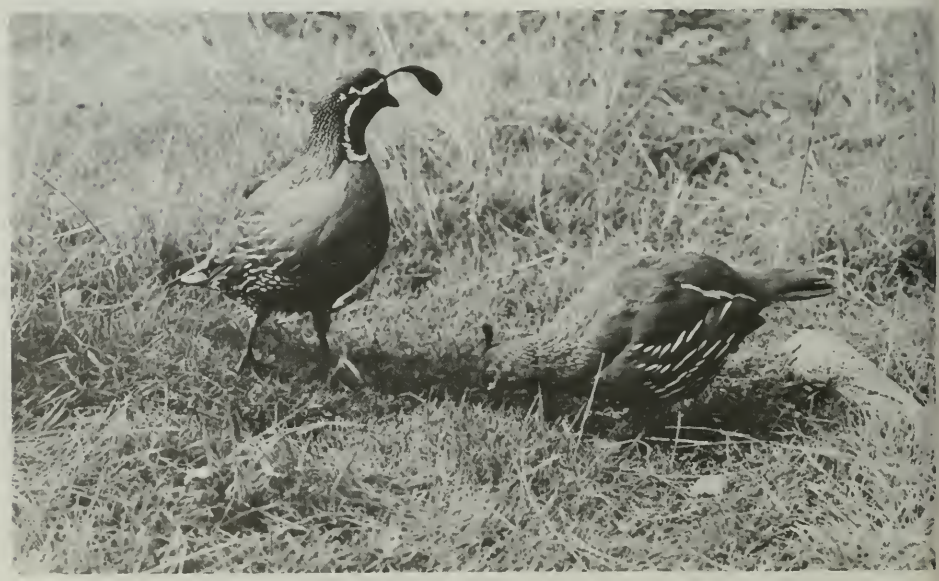
The mainstay of the Butte Valley economy is agriculture. The most important crops are hay, barley, wheat, potatoes, and irrigated pasture. Raising beef cattle is also very important.

Butte Valley has shown a marked change in irrigated lands since 1956. Total irrigated acreage has increased from approximately 12,000 acres in 1954 to about 27,700 acres in 1970. The cropping pattern also shows changes, with many acres of potatoes and alfalfa planted where pasture was grown in 1956. The total potentially irrigable land within Butte Valley is estimated at approximately 46,000 acres.

The second largest industry within the study area is timber production. Most of the timber harvested within the Butte Valley Basin is taken to other areas for milling. This has limited to a considerable extent the resulting benefit to the area's economy from the timber operations since most of the labor required in lumber processing is employed in the milling operation. One lumber mill at Dorris ceased operation in 1971 and has since been dismantled.

The only remaining significant source of income to the area is recreation. Portions of the Klamath National Forest lie within the Butte Valley Basin and provide excellent summer recreation and fall deer hunting. Juanita Lake and Orr Lake provide fishing and limited amounts of other water-associated recreation. Meiss Lake is privately owned and provides waterfowl hunting for the members of a private club on the Meiss Lake Ranch.

During the waterfowl hunting season, many thousands of people travel through Butte Valley on their way to the Tule Lake-Lower Klamath National Wildlife Refuges a few miles to the east. Although these people spend some money in Butte Valley for food and gasoline, the local economy would benefit more if hunters were attracted directly to Butte Valley, where they would need lodging, meals, gasoline, hunting equipment, and other miscellaneous items.



Landownership Patterns

Landownership patterns in Butte Valley have changed greatly from the days of original settlement. At that time the valley was divided into relatively small family farming units, but many of the initial homesteading efforts ended in failure. In 1920, development of the valley took a new turn with the formation of the 29,000-acre Butte Valley Irrigation District. The District constructed water supply canals, laterals, and a pumping plant to take water from Meiss Lake to the town of Macdoel and the area north of Macdoel. However, Meiss Lake proved to be an unreliable source of water for irrigation, and the system was abandoned.

Much of the land within the original boundary of the Butte Valley Irrigation District was gradually excluded until the area covered by this District was reduced to its present 5,000 acres in the southwestern portion of the valley as shown in Figure 1. The District, which is comprised of the holdings of about 25 individual owners, has been operated very successfully in recent years.

A large holding of agricultural land covering approximately 8,000 acres in the west central portion of the valley is controlled by the Meiss Lake Ranch. This ranch has changed hands several times in recent years and is now owned by the Armendaris Corporation and managed by Oppenheimer Industries of Kansas City. Cattle raising and grain production provide most of the income to this ranch. In 1972, a private waterfowl club was formed on the ranch and some income is presently derived from this source.

Other large holdings in the Butte Valley area are the Prather Creek Ranch southwest of the Butte Valley Irrigation District, Coulson Farms southwest of the irrigation district, and the Lutz Ranch in the extreme southern end of the valley. The remaining privately owned land in the valley is divided into approximately 150 holdings, ranging in size from 40 to 1,000 acres. The land ownership pattern in the valley is currently trending toward consolidation of property into larger ranches. The owners of these larger ranches are clearing additional native brush-covered lands and putting them into agricultural production.

The largest single holding in the valley is an 18,000-acre parcel of federally owned land located near the geographic center of the valley north of Macdoel (Figure 1). Some early attempts were made to homestead portions of this federal land and convert it to agricultural production, but most of it remains undeveloped primarily because of poor soils. Much of this land was acquired during the early 1940s from the Butte Valley Irrigation District under Title 3 of the Bankhead-Jones Farm Tenant Act of 1937. During the period from 1943 to 1950, the U. S. Soil Conservation Service cleared brush, seeded grass, constructed fences, and developed stockwater on some portions of the federal area. Since 1954, this land has been administered by the U. S. Forest Service. A grazing agreement with the Butte Valley Soil Conservation District has allowed district permittees to graze approximately 600 head of cattle on this land for about 4½ months during the spring and early summer. The U. S. Forest Service, recognizing the agricultural limitations of the land, has been looking for additional ways in which this land could be more beneficially used. Development of a wildlife management area appears to be a very good possibility.

CHAPTER III. WATER SUPPLY AND LAND USE

The Butte Valley Basin is an unusual area from a water supply standpoint. The southern two-thirds is composed of highly permeable volcanic formations, whereas much of the northern portion is a region of thick lakebed deposits of low permeability. There are no perennial streams flowing through the valley; therefore, surface water diversions are limited and are found only along the extreme southern and western edges of the valley. Butte Valley relies mainly upon pumping large amounts of ground water (about 63,000 acre-feet per year) to meet summer irrigation demands.

In 1953-54, the U. S. Geological Survey conducted a study of the Butte Valley area to determine the extent of ground-water-bearing formations in Butte Valley and the sources of supply to these formations. In 1960, the USGS published Water Supply Paper 1491 entitled "Geology and Ground Water Features of the Butte Valley Region, Siskiyou County, California". This report states that the most productive aquifer in Butte Valley is the Butte Valley basalt, which is a series of comparatively thin basalt flows highly fractured by a system of vertical joints and shrinkage cracks. Wells in these rocks generally yield abundant quantities of water, with flows of 2,000 to 3,000 gallons per minute being quite common. The total area of the Butte Valley basalt is approximately 100 square miles, with 75 percent exposed on the surface and 25 percent underlying the southern portion of the valley. Most of the irrigation water needs of Butte Valley are supplied from this formation.

Lands irrigated and water used in the Butte Valley Basin have increased steadily during the last 20 years. In 1954, approximately 12,000 acres were irrigated with 18,000 acre-feet of surface water and 20,000 acre-feet of ground water. By 1960, over 21,000 acres were irrigated with about the same amount of surface water and 30,000 acre-feet of ground water. In 1970, 27,700 acres were under irrigation using 20,000 acre-feet of surface water and approximately 63,000 acre-feet of ground water. While surface water use has remained almost constant for the past two decades, ground water use has increased about 2,800 acre-feet per year. The high growth rate of agricultural water use is expected to decline in the future because most of the high quality agricultural land has been developed. Much of the remaining land is restricted for agricultural development by one or more undesirable factors such as poor soils, high subsurface water elevations, or high salinity levels. It would be much more expensive to produce paying crops on lands with these problems than it is on the better lands. Therefore, an economic limit will be reached where potentially irrigable lands will remain undeveloped because it would be uneconomical to develop them.

The total amount of land in Butte Valley suitable for irrigated agriculture is estimated at approximately 46,000 acres. Of this amount, about 27,700 acres are already under irrigation, and 15,000 acres would require correctional reclamation work before competitive crop yields could be obtained. Estimates based on the above observations indicate that approximately 37,000 acres could be irrigated by the year 2020. This would require an agricultural water supply of 109,000 acre-feet. Table 1 shows the present and future basin water demands, assuming construction of the wildlife enhancement project prior to 1990. Total 2020 applied water need for agriculture, urban use, and wildlife enhancement is estimated at

TABLE 1

WATER DEMAND AND SUPPLY IN BUTTE VALLEY BASIN

	1960	1970	1990	2020
Population	2,000	2,000	2,200	2,500
Urban Water Demand (acre-feet)	700	700	800	1,000
Irrigable Land (acres)	46,000	46,000	46,000	46,000
Irrigated Land (acres)	21,000	27,700	31,400	37,000
Agricultural Water Demand (acre-feet)	50,000	82,300	94,200	109,000
Wildlife Enhancement Water Demand on Project Lands (acre-feet)	--	--	10,000	10,000
Total Water Demand (acre-feet)	50,700	83,000	105,000	120,000
Developed Water Supply (acre-feet)				
Surface Water	20,000	20,000	20,000	20,000
Ground Water	30,700	63,000	85,000	100,000
Net Increase in Ground Water Extractions Above 1970 Levels* (acre-feet)	--	--	19,000	30,000

*Water demand is expressed as applied water of which only 75 percent is consumptively used through evaporation and transpiration. Theoretically 25 percent of this applied water will be available for recharge back to the ground water basin. This would not hold true on the project area where soils are impervious but is generally true on agricultural lands. Therefore, the increase in applied demand from ground water of 38,000 acre-feet between 1970 and 2020 is a net increase in ground water extractions of approximately 30,000 acre-feet on an annual basis.

120,000 acre-feet with ground water supplying approximately 100,000 acre-feet.

Surface Water

Butte and Antelope Creeks, and four small creeks which flow directly into Meiss Lake, are the only significant streams in the Butte Valley Basin. Rainfall patterns along these creeks are very similar, as shown by the isohyetal map, Figure 2. Average annual precipitation ranges from 10 inches in the lower portion of the creeks to a maximum of over 40 inches at the headwaters. Snowmelt runoff is a large factor in maintaining early spring and summer flows in these creeks.

Butte Creek, which drains an area of 178 square miles, is by far the largest stream in the basin. However, its average annual surface runoff of approximately 13,000 acre-feet at a gaging station northeast of Orr Mountain is less than 10 percent of the amount of water that falls within the Butte Creek watershed. The majority of the annual precipitation, therefore, appears to percolate underground through the pervious volcanic formations into the ground water basin.

Butte Creek no longer flows into Meiss Lake as it did prior to development of the Butte Valley Irrigation District. During periods of high flow, Butte Creek is diverted at two locations into small natural storage reservoirs which allow the surplus water to percolate into the ground water system. The first such diversion is into Dry Lake located 2 miles southwest of the town of Bray. This diversion, which was constructed by the Corps of Engineers as an emergency flood control measure in 1965, can carry approximately 100 second-feet.

The next diversion is east of Orr Mountain, approximately 8 miles south of the town of Mt. Hebron. This diversion leads to a natural depression on the west side of Cedar Mountain known as Cedar Mountain Reservoir. As the water rises in this depression it reaches a lava tube in the basalt formation, known locally as the "crevasse", and flows underground. The Corps of Engineers constructed this diversion as an emergency flood control measure in 1965 but the Butte Valley Irrigation District has since improved it by constructing a permanent low dam and canal. Water is carried to Cedar Lake only during periods of surplus flow, usually from December through early May.

Surface water from Butte Creek is used for irrigation during spring and summer by ranches located from Bray to the Butte Valley Irrigation District. Although the total amount of surface water obtained from this stream is usually small in comparison to the water pumped from ground water, Butte Creek is very valuable in recharging the ground water system from which the majority of ranches and farms in the valley derive their water supply.

Antelope Creek, the second largest stream in the valley, drains the southeastern portion of the Butte Valley Basin. Its source of water is the volcanic mountains to the north and east of Mt. Shasta. The stream ends abruptly at Antelope Sink on the south side of Cedar Mountain. This stream is gaged above the small community of Tennant. The drainage area at this location is 18.6 square miles, and the average annual runoff is approximately 23,000 acre-feet per year.

Indications are that Butte Creek loses most of its water to the ground water basin as it flows towards Butte Valley. This is partially evidenced by the fact that the unit runoff of Butte Creek is only 70 acre-feet per square mile, while the runoff of nearby Antelope Creek is 1,200 acre-feet per square mile in an area of similar rainfall

patterns. All the Antelope Creek flows not diverted or evaporated also eventually percolate into the ground water system after ponding in Antelope Sink. From this sink, ground water is believed to move in a generally northwesterly direction from Cedar Mountain into the Butte Valley area. Therefore, Antelope Creek is also very important to underground recharge of Butte Valley. There are no flood control projects and only a few summer surface diversions along Antelope Creek.

Meiss Lake and Drain

Meiss Lake is supplied by Prather, Ikes, Harris, and Muskgrave Creeks, which drain the western slopes of the Butte Valley Basin. The total drainage area contributing to Meiss Lake from these creeks is approximately 29 square miles, and the estimated average annual runoff is between 15,000 and 20,000 acre-feet. During the early 1940s, the owners of Meiss Lake Ranch constructed a dike to move Meiss Lake east of its natural location and thus to reclaim productive lake bottom lands for grain and hay production.

In the spring of 1965, the U. S. Corps of Engineers constructed a floodwater drainage channel from Meiss Lake to the Klamath River. This channel leads north from Meiss Lake through the Sam's Neck area where the water is pumped to Rock Creek, a small tributary of the Klamath River. This diversion has successfully prevented large-scale flooding of the Meiss Lake Ranch during the 8 years since its construction. However, Klamath River fishermen and land developers have objected to the importation of poor quality, highly turbid Meiss Lake overflow water during early spring months. Meiss Lake Ranch is presently responsible for operation and maintenance of this flood control facility.

Evaporation and agricultural water use by the Meiss Lake Ranch remove most o the water from Meiss Lake by late fall but the lake has not gone completely dry through evaporation since 1955. I was pumped dry in 1965 after construction of Meiss Lake Drain. The owners of Meiss Lake Ranch have become interested in maintaining high fall water levels in the lake because of the recent formation of a waterfowl club. The only time that surplus water exist in Meiss Lake is during January throug March of unusually wet years.

Ground Water Resources

It was not within the scope of this study to determine the safe yield of the Butte Valley ground water basin. This would be a difficult task requiring considerable time and expense to accomplish. However, there is considerable data available concerning groun water supplies in Butte Valley, and this information is used as a basis fo estimating the sufficiency of this source of water to supply a wildlife enhancement project.

A hydrologic balance of the Butte Vall Basin was prepared to estimate the general magnitude of water supply which may be available in the basin. This procedure involves subtracting the amount of water known to be consumptively used or lost from all the known inflow into the basin. The amount of water remaining is theoretically the volume available for additional use. This procedure is not extremely accurate, but it does give an indication of the water available. When combined with knowledge concerning the present and historic condition of the ground water basin, the hydrologic balance can help determine if it is reasonable to expect the basin to provide an additional water supply.

The analysis indicates that the ground

water basin could possibly supply an additional annual net ground water extraction of approximately 40,000 acre-feet. This amount of additional ground water could adequately meet the estimated 2020 water demands as shown in Table 1.

Continuing observations should be maintained to detect early signs of the ground water table lowering. Any rancher can easily measure his own well water level if his well is so constructed that a steel tape can be inserted. Measurement of a well twice a year, in the spring before pumping and in the fall at the end of the irrigation season, is sufficient to establish the trend of ground water levels. Significant lowering of the ground water table over several years will serve as a warning that pumping is exceeding recharge.

Many individuals in Butte Valley believe that the ground water resources of the area are threatened by the present level of use, and that supplemental water supplies will be needed very soon. However, closely monitored ground water level measurements by the Department at selected locations during 1971-72, and periodic measurements made by the Department and the Bureau of Reclamation since the early 1950s, indicate no downward trend in ground water levels. Although well water levels are now drawn down lower during August when the heaviest pumping occurs and some older wells with shallow pump-bowl settings sometimes lose prime, it is most significant that water levels begin to recover as soon as the pumping demand slackens and that spring water levels in the valley have not declined noticeably in the last 20 years. This is shown in Figure 4.

Five wells in Butte Valley were equipped with continuous water level recorders from April 1972 to March 1973 as part of this study. The water levels in these wells were highest in April at the beginning of the irrigation season and gradually decreased to a low point in August. After the end of the irrigation season, the water levels made a rapid recovery to near the spring levels.

Another indication that the ground water supply is not being overdrawn is the fact that the flow of springs located on the east side of Mahogany Ridge have not varied significantly as pumping in Butte Valley has increased. Springs and hillside seeps, which are believed to be supplied by the ground water outflow from Butte Valley, have a combined flow of approximately 40 cubic feet per second and vary only slightly during the year.

In summary, there is little evidence that the ground water resources of Butte Valley are presently being overdrafted. Ground water levels for the past 20 years have recovered to a consistently high level each spring even through ground water pumping has increased greatly during the same 20 years.

Additional information on water level measurements and other technical aspects of the project is contained in a separately published appendix to this bulletin.

Possible Alternative Water Supplies

During this investigation, the problem receiving the most study was a determination of the best source of water supply to serve the potential wildlife area. The following possible water supplies were considered:

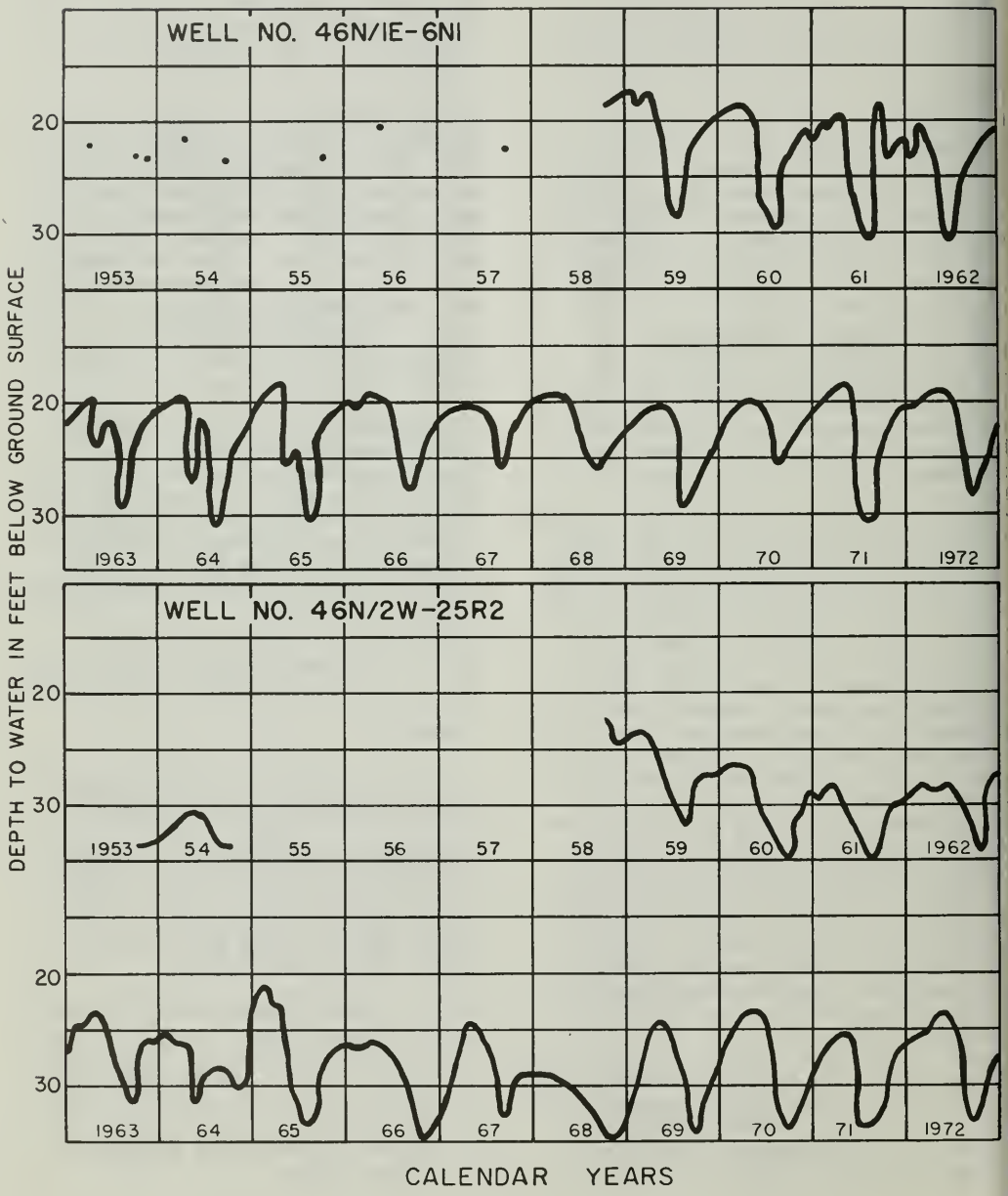
1. Diversion of water from Butte and Antelope Creeks.

2. Utilization of floodwaters from Meiss Lake.

3. Diversion of surface water from Shovel Creek.

Figure 4

WATER LEVELS OF TWO BUTTE VALLEY WELLS WITH LONG TERM RECORDS (1953-1972)



4. Utilization of ground water from the Butte Valley Irrigation District.

5. Development of ground water beneath project lands.

Diversion from Butte and Antelope Creeks is probably the most obvious potential source of water to project lands. These creeks carry large amounts of water during early spring and the diversion of these waters into the wildlife area would not be difficult. However, surplus water would only be available from December through April, whereas most of the demand for water on project lands is during September through November. Therefore, a surface diversion from these creeks would necessitate storing considerable amounts of water throughout the spring and summer months when evaporation rates are highest. Also, almost all of the spring flows of these streams seep into the ground water system and flow in a northwesterly direction toward Butte Valley, thus adding to the ground water supply.

Confirmation of this general flow pattern is seen in the early spring when initial diversions into Cedar Lake create turbid water which flows into the "crevasse" and then appears in the wells on the Lutz Ranch in southern Butte Valley. Also, the fact that a large amount of water is recharging the Butte Valley ground water basin leaves little doubt that Butte and Antelope Creeks are contributing substantially to this recharge. Therefore, water which would have to be diverted as surface flows from Butte and Antelope Creeks in the winter and held all summer in storage could more advantageously be pumped from the ground water basin when and where it is needed. This would eliminate the necessity of constructing diversion structures, storage reservoirs, and several miles of canals leading to project lands.

Floodwater from Meiss Lake is another potential source of water supply to the project lands. This floodwater is presently pumped from the lake through Sam's Neck drain into the Klamath River. The diversion of this floodwater creates two problems which could be at least partly alleviated by using this water on the wildlife project area. First, the salt and turbidity levels of Meiss Lake water are considerably higher than that of Klamath River water. This causes downstream water interests such as resort developers and sportsmen to complain when the diversion occurs during the fishing season. Second, operation and maintenance costs of pumping this water out of the basin are quite high. These costs could be reduced if some of the floodwater were used locally.

A cursory analysis of the frequency and magnitude of floodflows available from Meiss Lake based on data collected since construction of the drain in 1965 indicates that a minimum of 3,000 acre-feet of surplus water is available approximately one year in three. Since this water would be inexpensive to transport to the project area and would have certain environmental benefits, it is considered a good source of supplemental water during wet years.

Diversion from Shovel Creek is another source of water briefly considered. Shovel Creek is located immediately outside the Butte Valley hydrographic unit on the northwest side (Figure 1). Shovel Creek, at the upper crossing just above the Shovel Creek Guard Station, drains an area of 14 square miles and has an average runoff of approximately 15,000 acre-feet per year. This creek flows into the Klamath River 4 miles upstream from Copco Lake. In the early 1920s, Shovel Creek water was diverted and stored in Meiss Lake for use within the irrigation district. Remnants of the old canal and flume can still be seen near the mouth of Flume Canyon Creek. A reconstruction of the Shovel Creek Diversion into Meiss Lake today would be quite expensive, probably

exceeding $1 million. Also, due to downstream water rights and fish maintenance problems, only winter flows would be available from the stream. For these reasons, diversion of Shovel Creek was not considered feasible.

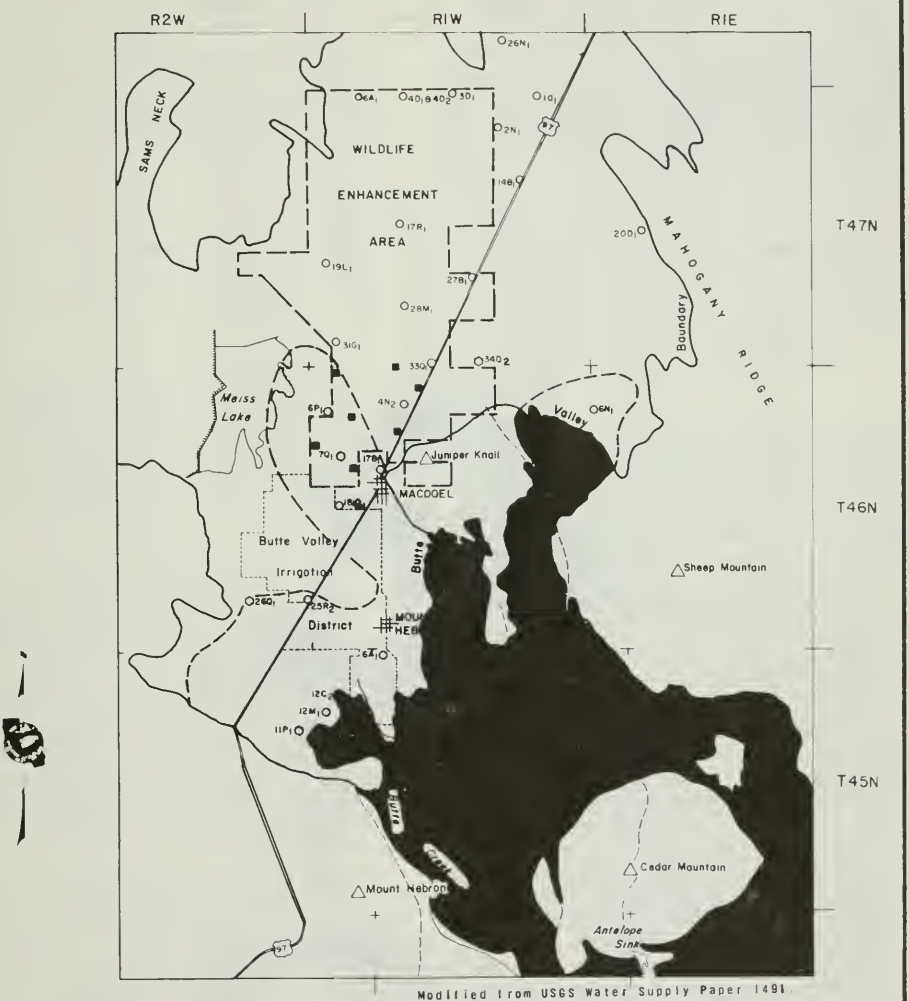
The Butte Valley Irrigation District was also considered as a source of water. The district delivers approximately 20,000 acre-feet of water per year to the service area with about 80 percent coming from the ground water basin and the remainder from Butte Creek. Wells in the district have water yields ranging from 700 to 4,000 gallons per minute and averaging about 2,000 gallons per minute. Beginning in September, at the end of the irrigation season, water from the district could be used to fill the seasonal marsh ponds, which must be filled in the fall. Obtaining water from the district, although feasible from a technical and probably a cost standpoint, would not be as desirable from an operational standpoint as developing a self-contained water supply on the project lands. Even if district wells were used in the fall, additional wells would be required within the project area to supply water during the summer to offset evaporation losses in the permanent pond.

Development of ground water on project lands was the final source of water supply considered. Successful wells could be drilled at most locations within the LUP area but deeper wells would be required in the northern and central portions than in the southern areas. Approximately 1,000 acres of land in the southwest portion overlie the Butte Valley basalt as shown on Figure 5. Numerous successful wells have been drilled in other parts of this formation; therefore, the probability of developing wells producing around 2,000 gallons per minute is considered very high. However, due to the limited area of underlying basalt, only about four wells could be developed in this area. Most of the remainder of the wildlife area overlies lake-deposited silts and clays extending to a maximum depth of around 1,000 feet Below these lakebed deposits lie water-bearing volcanic rocks. Few wells in the valley penetrate this formation but those that do generally yield enough water for irrigation.

On the southeast side of the LUP lands is an assemblage of volcanic rocks known as the Juniper Knoll pyroclastics Within this area is an accumulation of cinders and volcanic ash at least 400 feet thick near Juniper Knoll. This formation has good water-bearing properties, and 12 irrigation wells, 200 to 600 feet deep, obtain water from this source. It is probable that pyroclastic materials are interbedded with lake sediments within the project area to the north of Juniper Knoll. Therefore, this area is considered favorable for well exploration.

The average yield of wells which could be drilled on the LUP area is estimated at 2,000 gallons per minute. Approximately seven wells would be needed to supply the 30-cfs flow necessary to fill the seasonal marsh ponds in the fall. These wells would be drilled in the southern one-third of the project lands (Figure 5) and operated mainly during the fall and winter. Since these wells will be operated principally during the fall nonirrigation season, they are expected to have littl effect upon ground water levels in the rest of the valley during the irrigation season.

The U. S. Bureau of Reclamation, in a 1971 publication entitled "Upper Klamat River Basin", reported a possible plan for importing Klamath River water into Butte Valley. Although water may someday be developed from the Klamath River as part of a basinwide plan, the Klamath River was not evaluated as a source of water for the proposed wildlife management area.



LOCATION BUTTE VALLEY BASALT
AND
SELECTED WELLS IN BUTTE VALLEY
SISKIYOU COUNTY

In summary, the best sources of water supply to serve the potential Butte Valley wildlife enhancement area are wells constructed in the southern end of project lands, and floodflows from Meiss Lake during the months of January through March of wet years.

Water from the Butte Valley Irrigation District might also be a favorable alternative if a long-term agreement could be reached with the district. Direct diversions from Butte, Antelope, or Shovel Creeks do not appear to be favorable alternatives.

CHAPTER IV. THE WILDLIFE MANAGEMENT PLAN

The Butte Valley wildlife enhancement project area is presently dry and barren, supporting mainly sodium-tolerant desert-type vegetation such as sagebrush, salt grass, and juniper trees. With the development of a water supply, construction of waterfowl ponds, and planting of dry-farmed cereal grains, this area could become a wildlife management area on a par with some of the better state and federal refuges.

This chapter discusses the natural suitability of the LUP land for wildlife enhancement and describes the necessary facilities and plan of operation for conversion of this land into a wildlife management area.

Topography and Soils

The project area overlies an old lakebed which is quite flat except for volcanic outcrops at Indian Point and Juniper Knoll. Wind action has created some small knolls 3 to 5 feet high and has shifted fine-grained surface materials to form mild slopes, depressions, and ridges. These topographic features were considered in selecting the best areas to construct waterfowl ponds.

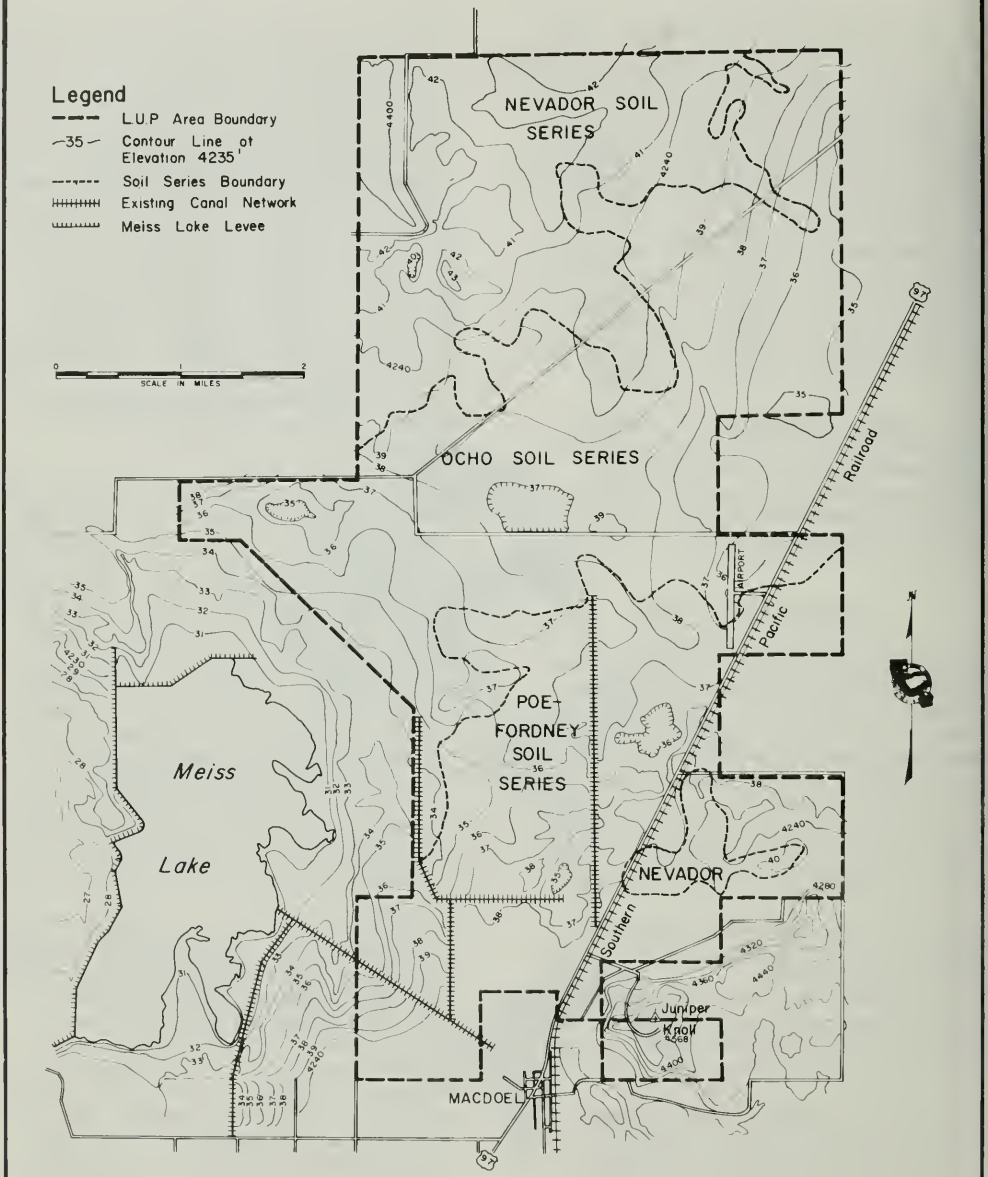
Another factor which influenced the project's design was the type of soils found in the project area. The soils were examined to determine their potential for agricultural production, their ability to hold ponded water, and their structural characteristics.

Basically, three soil series exist within the project area (Figure 6). The most desirable soil for agricultural purposes is the Poe-Fordney series, located in the southern portion of the project area. The surface of this soil is sandy and slightly sodic, and is suitable for sodium-tolerant crops. Hard lenses of compacted clay or lime-cemented layers approximately 18 to 30 inches below the soil surface restrict the agricultural potential of this soil by limiting both infiltration of water and the depth of root growth of crops. This area would be used mainly for growing dry-farmed grain, and alkali bulrush and sago pondweed in seasonal marsh ponds. The dry-farmed grain and alkali bulrush would provide food for upland game and waterfowl. The pondweed would be eaten by waterfowl.

The northwestern portion of the project area contains Nevador soils which are similar in many ways to the Poe-Fordney soils, but are slightly more restrictive for agricultural uses. The surface is medium-textured, loamy sand which is moderately sodic. Big sage, rabbit brush, and salt grass presently grow on these soils. A series of hardpans underlie the surface soil at a depth of 18 to 30 inches. The permeability of the surface soil is fairly high but the underlying layers restrict water movement. The area has potential for growing cereal grains, range cover, and wildlife-oriented aquatic plants such as alkali bulrush.

The central portion of the project area is covered with a highly sodic soil of the Ocho series. The surface is underlain with cemented subsoil layers of lime carbonate varying from several inches to several feet in thickness. Only 5 percent of the area supports vegetation, since only the most alkali-resistant plants can survive. The agricultural potential of this area is therefore extremely low. Certain locations in this area, however, contain a mixture of silt and clay which make the soil suitable for construction of pond dikes. Ocho soils are also very impermeable and therefore ideal for ponding.

Figure 6



CONTOURS AND SOIL SERIES
BUTTE VALLEY
WILDLIFE ENHANCEMENT AREA
SISKIYOU COUNTY

Management Concept

The Butte Valley wildlife area would be managed for several wildlife-related purposes. The primary purpose would be to provide adequate food and favorable living conditions for migrating waterfowl. Other wildlife species such as upland game, songbirds, raptors, shorebirds, antelope, and deer would also be provided for in the management of the wildlife enhancement area (see Table 2).

Duck, goose, and pheasant hunting would be a major project purpose, and revenues from hunting licenses and user fees are expected to pay a part of the costs of operating the wildlife area. Growing interest and concern over wildlife and ecology have created an increased demand for personal contact with nature. Therefore, birdwatching, nature photography, conservation education, and close contact with wildlife would be encouraged by the construction of a nature study pond, with bird-viewing blinds, trails, and other visitor facilities.

Basically, wildlife require adequate food, water, and suitable shelter for survival. The plan presented herein attempts to provide these basic needs for as many species of wildlife as possible. The most numerous waterfowl which would use the refuge on their southward migration in the fall are: mallard, pintail, gadwall, cinnamon teal, redhead, ruddy, lesser scaup, shoveler, and canvasback ducks, and Canadian, snow, and white-fronted geese. Cereal grains and alkali bulrush would provide adequate food for these species and approximately 3,900 acres of ponds would supply the necessary water area.

In the spring, many birds would breed on the project area and produce a significant number of offspring which would contribute to the waterfowl population. Waterfowl breeding is a project purpose which would be encouraged by the construction of nesting islands and the planting of nesting cover. At the Tule Lake-Lower Klamath National Wildlife Refuges, four basic types of nesting areas are used by waterfowl. These are dikes, marshes, islands and fields. Canada geese prefer islands, the tops of muskrat houses, or tule mats that are elevated, surrounded by water, and command a view of the surrounding area. The plan includes construction of 115 nesting islands on the wildlife area which would provide ideal nesting for Canada geese. Mallard ducks prefer medium to high cover around their nests. Gadwalls prefer nesting on islands, with fields as a second choice. Pintails show a preference for fields with a medium to low cover, while redhead and ruddy ducks prefer marshes with high cover, such as round-stemmed bulrush and cattail. All of the species expected to nest in the wildlife area would find suitable food, habitat, and cover.

The basic needs of upland game birds -- water, food, and escape and resting cover -- would also be provided on project lands. Cereal grains and alkali bulrush would provide food for ring-necked pheasants. Shrubs, willows, and vines planted at strategic locations would supply escape and resting cover. To augment water supply for California valley quail, guzzlers which collect and store precipitation would be installed. The planting of trees on project lands would augment nesting sites for mourning doves.

Nongame wildlife, such as raptors (hawks and eagles), shorebirds, and songbirds, would also be enhanced by the project. Greater sandhill cranes could use the area for nesting and resting. Whistling swans and white pelicans would frequent the area during their migrations.

TABLE 2

MAJOR WILDLIFE SPECIES THAT WILL USE
THE PROJECT AREA

MAMMALS

- Prong-horned antelope
- Mule deer
- Coyote
- Black-tailed jackrabbit
- Nuttall cottontail
- Townsend chipmunk
- Muskrat

WATERFOWL

- Canada goose
- Snow goose
- White-fronted goose
- Whistling swan
- Mallard
- Pintail
- Gadwall
- Cinnammon teal
- Green-winged teal
- Blue-winged teal
- Shoveler
- Canvasback
- Redhead
- Lesser scaup
- Ruddy duck
- American coot

RAPTORS

- Red-tailed hawk
- Rough-legged hawk
- Sparrow hawk
- Southern bald eagle*
- Golden eagle
- Prairie falcon
- Marsh hawk
- Swainson's hawk
- Turkey vulture
- Ferruginous hawk
- Peregrine falcon*
- Great horned owl
- Cooper's hawk
- Goshawk

WATER-ASSOCIATED BIRDS

- Western gull
- Glaucous-winged gull
- White pelican
- Great blue heron
- Western grebe
- Eared grebe
- Avocet
- Willet
- Killdeer
- Forster's tern
- Spotted sandpiper
- Western sandpiper
- Long-billed dowitcher
- Short-billed dowitcher
- Northern phalarope
- Wilson's phalarope
- Semi-palmated plover

UPLAND ASSOCIATED BIRDS

- Greater sandhill crane
- Mourning doves
- Ring-necked pheasants
- Valley quail
- Black-billed magpie
- Crow

*Rare or endangered species.

At least 14 species of raptors have been observed in Butte Valley. Red-tailed hawks, rough-legged hawks, and sparrow hawks accounted for 70 percent of the sightings made during a 1971 survey. Other species encountered were golden eagles, bald eagles, prairie falcons, and peregrine falcons. Raptors require suitable roosting and nesting sites, and such sites would be provided by planting trees and by constructing artificial structures such as platforms on poles in the wildlife area until the trees are established. Raptors feed on rodents and crippled or dead waterfowl, thus performing a desirable function in maintaining a balanced environment.

Shorebirds are interesting to observe and 10 species are presently found on or around Meiss Lake. Killdeer, spotted sandpiper, willets, avocets, and long-billed dowitchers are common nesters, and five other species are periodic visitants to Meiss Lake. These shorebirds require mudflat feeding areas; therefore, a portion of seasonal marsh number 4 would be operated as a mudflat feeding area for these birds.

The greater sandhill crane appears seasonally in Butte Valley, and over 3,000 have been observed west of Macdoel during their spring migration. A limited amount of crane nesting presently takes place in the grain fields adjacent to Meiss Lake. Suitable nesting sites appear to be the limiting factor restricting greater use of Butte Valley by these birds. Construction of three nesting mounds, 2 feet high, are proposed for the large grain field in the northeast portion of the project area. If these mounds prove successful, more could be built in the future.

Several other species of birds, including magpies, grebes, gulls, and terns are found on or near Meiss Lake, and most would find additional habitat in the project area.

Pronghorn antelope and mule deer use the northern portions of the project area around Indian Point. Antelope cross through the project area from Meiss Lake Ranch to the Macdoel-Dorris area. The needs of deer and antelope have been considered by planning for easy access across the wildlife area. Cattle fences would be easily negotiated by big game, and canals and ditches would be designed for easy crossing. Also, ponds are separated sufficiently to provide dryland routes for migrating game.

Livestock grazing is an established use of the LUP area, and it is important to many ranchers living in Butte Valley. The U. S. Forest Service has converted over 3,000 acres of native vegetation to intermediate and crested wheat grass. These converted areas, along with native vegetation, provide feed for 600 cattle during $4\frac{1}{2}$ months between May 1 and September 15. The total grazing allotment for the area is 2,700 animal unit months. Livestock, when used properly, are a benefit to the wildlife manager for controlling vegetation. Therefore, cattle grazing on project land would be continued but carefully controlled. Two to three years after project construction, when the newly planted vegetation has become firmly established, the grazing allotment would be approximately 2,000 animal unit months. One animal unit month is a measure of feed required to maintain one animal for a period of 30 days.

Physical Features

The conversion of dry, barren land into an area for wildlife, hunting, and other recreational uses necessitates the construction of ponds, canals, roads, nesting and feeding areas, visitor accommodations, and other facilities. A plan of the main facilities proposed for the Butte Valley wildlife area is shown in Figure 7. Table 3 gives a

tabulation of land use in the 18,000-acre wildlife enhancement area.

TABLE 3

LAND USE IN THE BUTTE VALLEY WILDLIFE ENHANCEMENT AREA

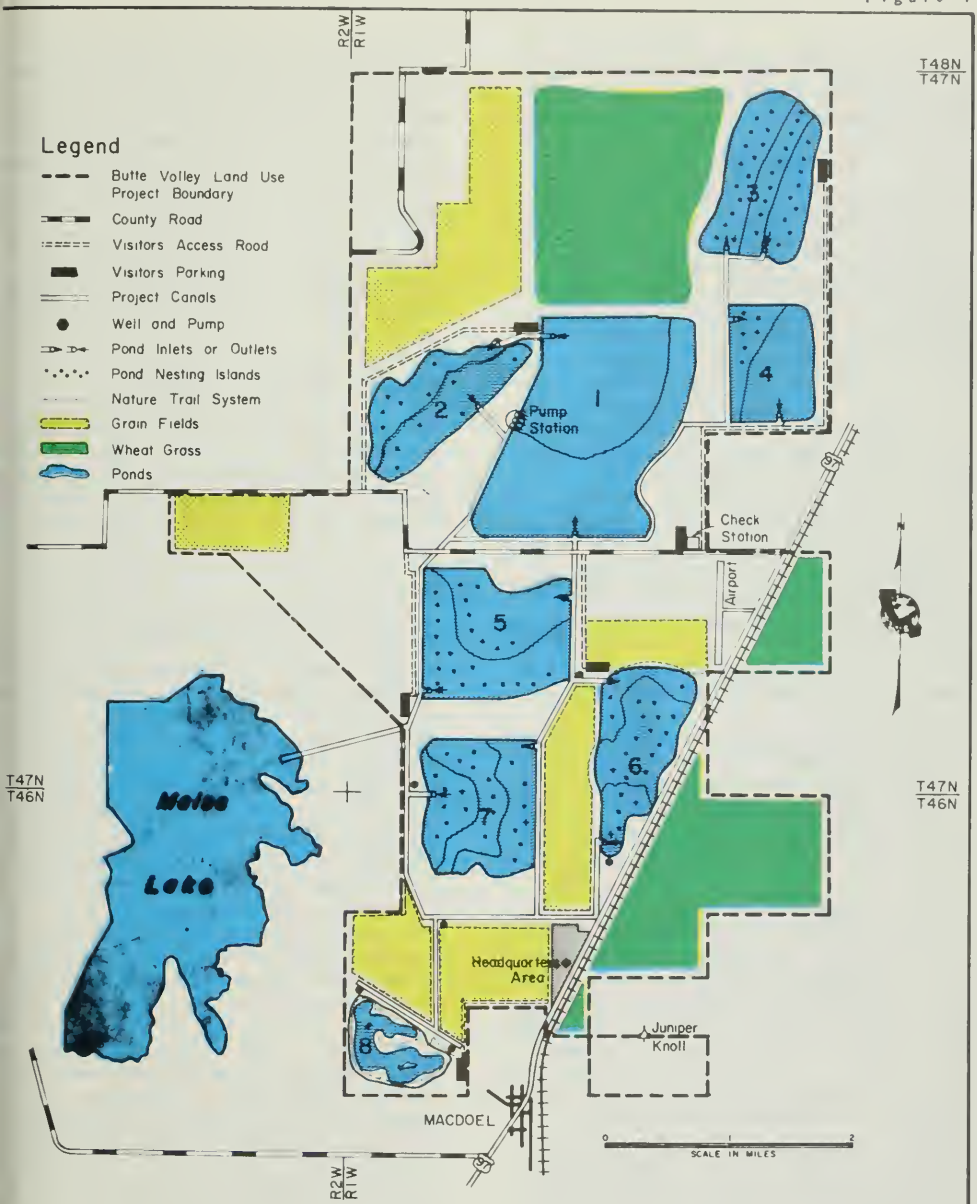
Land Use	Area (In Area)
Permanent Ponds	1,100
Seasonal Marsh Ponds	2,800
Grain - Dry Farmed	2,500
Revegetated Wheat Grass (cattle grazing)	3,000
Miscellaneous (roads, canals, administration area)	100
Total Developed Area	9,500
Undeveloped Area	8,500
Total Project Area	18,000

The heart of the project is pond 1, a 1,000-acre permanent pond which would lie immediately north of the county road crossing the LUP area. This pond would be enclosed by an 8-foot-high dike, vary in depth from 3 to 6 feet, and provide 6,000 acre-feet of storage. Three thousand acre-feet of this storage would be usable storage which would partially supply water to the seasonal marsh ponds in the fall. A pump station located on the west edge of the pond would lift water from the main canal into the pond. A cross levee in the permanent pond would help maintain a uniform depth and reduce erosive wave action. The top of the perimeter levees would be 12 feet wide to accommodate vehicular travel.

In addition to the permanent pond, six seasonal marsh ponds would be constructed with levees averaging 3 feet high. These ponds would cover 2,800 acres, and their maximum water depth would be 2 feet. They would have a combined capacity of 5,600 acre-feet and would vary in size from 350 to 630 acres.

Within the seasonal marsh ponds, 115 nesting islands, 20 feet long and 12 feet wide, would be constructed. These islands would be at least 2 fee above the maximum water level in the ponds. The slopes of the islands woul be planted with salt grass and alkali bulrush to prevent erosion, but, if serious erosion occurs in spite of pr tective efforts, artificial nesting structures for geese and ducks should constructed. A second permanent pond 8, would have a dike 3 feet high whic would enclose 200 acres. The permanent water area of this pond would meander inside the dike and would cov 110 acres. The remaining 90 acres would be planted with willow, cottonwo poplar, and evergreen trees. Shrubs, such as golden willow, salt brush, an California rose would also be planted for wildlife cover. The entire 200 acres would be periodically flooded t irrigate the vegetation within the levee, but the water level would be allowed to recede to the permanent pond depth. This area would not be hunted but would serve as a conservato education area.

A deep canal would bring floodwater from the northeast end of Meiss Lake to the pumping station at the permanent pond. Floodwater would flow by gravity from the lake to the pumps a be lifted into the permanent pond. Meiss Lake floodwater would not flow directly into the seasonal marsh pon because floodwater would not be avai able during the fall when the ponds were being filled. Water would flow by gravity from the permanent pond t the seasonal marsh ponds. A system checks would regulate the filling an draining of individual ponds. The pumping station at the permanent pon would have three 25-horsepower pumps



DEVELOPMENT PLAN
BUTTE VALLEY
WILDLIFE ENHANCEMENT AREA
SISKIYOU COUNTY

capable of lifting water at a rate of 31 cubic feet per second 6 feet into the permanent pond.

A project headquarters area would be located in the south portion of the project near State Highway 97. Facilities in this area would include a project office, shop, vehicle and equipment storage buildings, and a maintenance yard. The headquarters would provide office space and a conference room for meetings and conservation talks to visiting groups.

An equipment storage building would be constructed and would include a tool room, washroom, and storage area for mobile equipment, tractors, plows, and other miscellaneous small equipment. A shop would be provided for the repair of mobile equipment and for general maintenance. Two grain bins would be used to store seeds out of the weather and away from rodents. Water would be provided to the headquarters by a well located in the center of this area.

A hunter check station would be located along the county road bisecting the project area, approximately 1 mile west of State Highway 97. This station would control the flow of visitors, and hunters would be checked into and out of the area at this point. The station would be far enough away from the headquarters to preclude interference with the normal business and maintenance operations occurring at the office. The check station would have an office with toilet facilities, exterior lights, and a public address system for directing hunters. It would be located next to one of six gravelled parking areas provided for hunters and visitors. Visitor access would be restricted to the all-weather surface roads leading to these parking lots. Additional maintenance roads would be constructed within the project area. Approximately 36 miles of roads would be required for the project.

Facilities for wildlife observations and educational purposes include a marsh observation platform, photographic blinds, and a nature trail located around pond 8. Another natur trail would pass by a portion of pond and pond 2. The remainder of the wil life area would be open to hiking and nature study. During the waterfowl hunting season, only the area around pond 8 would be closed to hunting.

Project Operation

In early September the seasonal marsh ponds would be completely dry and the permanent pond would be held at maximu capacity. When the waterfowl migratio begins in the fall, water would be spr into the seasonal marsh ponds to accom modate the influx of migrating birds. Three thousand acre-feet of water woul be released from the permanent pond to partially fill the seasonal marsh pond. At the same time, the seven project we located in the southern portion of the wildlife area would be operated at the maximum capacity to fill the seasonal marshes. These wells would pump water into the main ditch where it would the flow to the seasonal marsh ponds by gravity. At an inflow rate of 30 cubi feet per second, the average depth in the seasonal marsh ponds would be 1.2 feet by the beginning of October and 1.9 feet by the beginning of December. Additional inflow would not be required after the ponds were fille in early December.

Precipitation and evaporation from the ponds would be in equilibrium during January through March. Evaporation would exceed precipitation beginning in April and the ponds would completely evaporate by early August. The permanent pond, after releasing 3,000 acre-feet of water to the seasonal marsh ponds, would remain half filled to an average depth of 3 feet. The permanent pond would be refilled during the late

inter months by Meiss Lake floodwater hen available, or by pumping from roject wells. From May through August, round water pumping would be required nly to make up for evaporation losses rom the permanent pond and to irri- ate the conservation area. Less than ,000 acre-feet of water would be re- uired throughout the summer.

uring a normal year, approximately 0,000 acre-feet of water would be re- uired to meet the needs of the wild- ife enhancement area. In the event f an extended period of abnormally dry ears which produces a lowering of pring ground water levels, water use n the project area could be reduced emporarily until normal water condi- ions return. This could be accomp- ished by reducing the area of seasonal arsh flooded.

Plantings for Food and Habitat

The LUP area presently contains little habitat or food for waterfowl, upland game, or nongame wildlife species. Habitat would be developed by planting trees, shrubs, and vines for escape, resting, and nesting cover. Trees such as cottonwood, willow, poplar, olive, juniper, ponderosa, and scotch pine would be planted on the water side of levees and canals and along fences. Shrubs, such as saltbrush, golden willow, and southern wood may be adaptable to this area. Also, blackberries, raspberries, and California rose may be grown along the fences, levees, and canals for wildlife habitat.

The nature conservation area, pond 8, would be heavily planted with a wide variety of trees and shrubs by project personnel during the first 2 years of operation.

Three thousand acres of perennial crested wheat grass have been planted throughout the area to augment the cattle food supply. Some of these grazing lands would be converted to ponds and grain crops. Additional forage plantings on land east of State Highway 97 would keep the total revegetated area near its preproject levels.

Under project operation, cereal grains would be grown on approximately 2,500 acres. These grains would be dry-farmed to conserve water during the summer. The grain areas would be separated on project lands to encourage greater use of the area by waterfowl and to provide more suitable habitat for upland game. The grain would not be harvested but left in the field for use by wildlife. Only half of the total acreage allocated to grain production would be planted each fall. The other half would lie fallow for a year to replenish the soil moisture lost in crop production. This practice would provide green feed during the spring for geese, and matured grain in the fall for migrating waterfowl populations.

The seasonal marsh ponds would be planted with alkali bulrush, since the seeds make excellent food for ducks. The alkali bulrush, which would become established in approximately 3 years, would produce relatively high seed yields. Sago pondweed, hard stem bulrush, and cattails would volunteer in most of the ponds.

The project area would produce sufficient food to support an equivalent of 7,000,000 duck-days of feeding use annually. This number is based on a grain requirement of 4 ounces per duck per day.

Recreation Use

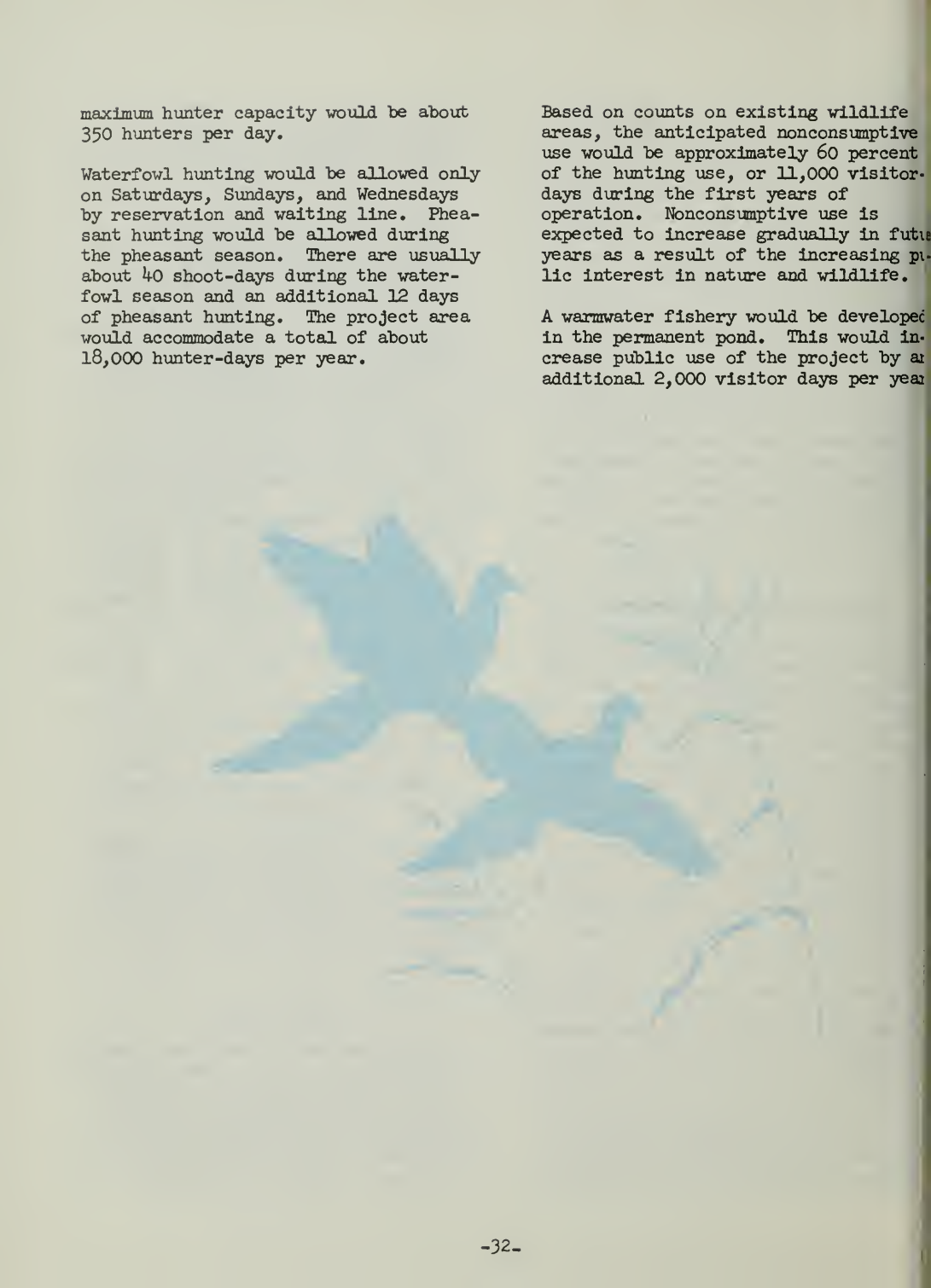
The public would use the Butte Valley wildlife area for hunting, birdwatching, nature photography, wildlife field studies, and sightseeing. Hunting would probably be regulated as it is on wildlife areas now operated by the Department of Fish and Game. The

maximum hunter capacity would be about 350 hunters per day.

Waterfowl hunting would be allowed only on Saturdays, Sundays, and Wednesdays by reservation and waiting line. Pheasant hunting would be allowed during the pheasant season. There are usually about 40 shoot-days during the waterfowl season and an additional 12 days of pheasant hunting. The project area would accommodate a total of about 18,000 hunter-days per year.

Based on counts on existing wildlife areas, the anticipated nonconsumptive use would be approximately 60 percent of the hunting use, or 11,000 visitor-days during the first years of operation. Nonconsumptive use is expected to increase gradually in futu years as a result of the increasing pu lic interest in nature and wildlife.

A warmwater fishery would be developed in the permanent pond. This would increase public use of the project by an additional 2,000 visitor days per year



CHAPTER V. PROJECT ACCOMPLISHMENTS, COST, AND IMPLEMENTATION

Wetland wildlife habitat in California has diminished at an alarming rate during the past century. Approximately 90 percent of California's once plentiful swampland has been drained and developed and the conversion is continuing. At the beginning of California's settlement, swamp conversion was logical and necessary, but in many people's opinion it is time to stop for the sake of our wildlife. However, due to tremendous economic pressures, some of the remaining privately owned marsh area will probably be developed for agriculture in the coming decade.

While wildlife habitat continues to decline, the demand for hunting and other outdoor recreation is increasing tremendously. Most state and federal game preserves are filled to capacity throughout the hunting season and many individuals are willing to pay from one hundred to several thousand dollars per season for the right to hunt in private gun clubs. However, the California Department of Fish and Game predicts a future decrease in the number of hunters if the current trend in diminishing wetlands continues.

Nonconsumptive recreational use of wetland wildlife areas such as bird-watching, outdoor photography, and nature study now approximates 60 percent of the total use and is increasing rapidly. Hunting use, on the other hand, remains nearly static because maximum capacities have been reached in most wildlife management areas. The need for additional wetland wildlife habitat is apparent to most hunters and conservationists, but opportunities for the acquisition or creation of wetlands are extremely limited.

Construction of the Butte Valley wildlife enhancement area would be a good opportunity to create wetland wildlife habitat and maintain it permanently for future generations. The project has in its favor several factors exhibited by few other potential wildlife areas. The land under consideration is federally owned and therefore would not have to be purchased. The land has little agricultural potential and there is little local interest in agricultural development of the area. Most of the soils are either impervious or underlain by shallow hard pans which restrict water percolation. Therefore, the area is suitable for the construction of waterfowl ponds.

The project could partially utilize Meiss Lake floodwater, which would reduce the volume of poor-quality water pumped into the Klamath River.

The Butte Valley wildlife enhancement project is located in the heart of the Pacific Flyway between the Tule Lake-Lower Klamath National Wildlife Refuges and Meiss Lake. Through the example of these nearby successful wildlife areas and those in the Sacramento Valley, it is possible to assess the potential accomplishments of the Butte Valley wildlife enhancement area. The project would provide the following annual direct benefits to wildlife and recreation users:

1. Furnish adequate food and habitat to support approximately 7,000,000 duck-days of use.

2. Provide habitat and nesting sites adequate for the natural production of 750 geese and 6,500 ducks.

3. Meet the demand for 14,000 waterfowl hunter-days, 4,000 upland game hunter-days, and 13,000 nonhunter-days of recreation use, which includes 2,000 visitor-days

of fishing use.

4. Supply living and breeding habitat for deer, upland game birds, and nongame species such as raptors, shorebirds, and songbirds.

5. Increase the natural habitat for rare birds, such as bald eagles and greater sandhill cranes.

Indirect benefits would include increased expenditures in Butte Valley for recreation related items such as food, gas, and lodging, thus broadening the economic base of the local economy.

Difficulty has been experienced by state and federal agencies in evaluating the monetary benefits of wildlife enhancement. Methods of benefit evaluation have been developed to determine the value of game animals. This is usually done by equating the average number killed for each hunter-day of use to a dollar value of a day's hunting. However, this type of analysis merely changes the question from the worth of a game animal to the worth of a day's hunting. No recognition is given to the other human uses of a game animal, such as seeing, studying, photographing, or just "knowing it's there". The value of a day's hunting by various methods of analysis ranges from $3.50 per day when only entrance fees are considered to over $50 per day when all related expenses are included. There is the question of whether the value of a day's hunting is only what the average hunter spends to enter a public hunting area, or his willingness to pay much larger fees to hunt on privately managed areas. Also, there is the question of whether all or any part of other hunting expenses, such as transportation, licenses, sporting equipment, and lodging, should be included in the value of a day's hunting.

As complex as it is to compute the economic value for game species, the problem is greatly intensified when the evaluation involves nongame wildlife, such as hawks, eagles, songbirds, and shorebirds, or rare and endangered species. Nongame species of wildlife are often not assigned any value because no procedural method is available to determine a benefit. The matter is further complicated when considering the recent change in public attitude from apathy to anxious concern toward natural environments and wildlife. This means that yesterday's wildlife benefit values, with only inflationary increases added, are not adequate today

The net effect of such uncertainties ha been wildlife benefits which vary tremendously, depending on the methodology and basic assumptions used in the analysis. These benefits often do not adequately reflect the full value of wildlife to society. Very few, if any, existing game preserves, parks, or wilderness areas would demonstrate a favorable ratio of benefits to costs using the traditional economic approach

Therefore, until an acceptable system is devised which will properly convert into monetary terms the many varied and important benefits that result from a marshland wildlife project, decisions on the justification of spending public funds for their development must be made by a concerned citizenry working through conservation groups and the Legislature. No final judgment on the justification of the Butte Valley wildlife enhancement project is made in this report; rather, the basic information necessary to critical evaluation of project desirability is made available.

The estimated capital costs of construc ting the Butte Valley wildlife enhancement project are itemized in Table 4. The total estimated cost at 1972 prices

TABLE 4

BUTTE VALLEY WILDLIFE PROJECT COST ESTIMATE

	Item	Item Cost
1.	Dike and Road Embankment	$ 740,000
2.	Canal Excavation	12,000
3.	Rock Road Surfacing (36 miles)	100,000
4.	Canal Checks, Turnouts, Gates, and Appurtenances	12,000
5.	Water Supply Wells and Pumps (7)	213,000
6.	Permanent Pond Pumps (3-25 HP)	27,000
7.	Fencing and Cattle Guards	146,000
8.	Headquarters Office (1,200 square feet)	24,000
9.	Equipment Storage Metal, Prefabricated Building (4,500 square feet)	45,000
10.	Vehicle Garage (3,000 square feet)	30,000
11.	Shop Building (4,800 square feet)	72,000
12.	Check Station (400 square feet)	6,000
13.	Grain Storage Bins (2)	2,000
	Subtotal (1-13)	$1,429,000
	20% Engineering and Contingencies	281,000
14.	Equipment	190,000
	TOTAL FIRST COST	$1,900,000
	Annual Operation, Maintenance and Replacement Cost	$ 180,000

is approximately $1,900,000. The estimated annual cost for operation, maintenance, and replacement of the project area is $180,000.

Several potential sources of funds could possibly be used to meet the capital costs of the Butte Valley Project. These fall into the general categories of federal, state, county, and private financing. If the project receives widespread public support, special legislation could possibly be enacted to finance it. The various potential federal and state programs that could provide funding for wildlife projects, and several private conservation organizations that might be potential contributors, are listed in Table 5.

If constructed, the Butte Valley wildlife enhancement project would probably be operated by one of three potentially eligible agencies: the U. S. Forest Service, the U. S. Bureau of Sport Fisheries and Wildlife, or the Department of Fish and Game. The previous involvement of these agencies in wildlife projects is discussed in the following paragraphs. This discussion makes no choice between them but merely lists their qualifications.

The U. S. Forest Service is probably the most logical operator of the project. This agency presently exercises control over the project lands and has expressed an interest in continued management responsibility. The Forest Service is also the only agency of the three discussed with a district office in Butte Valley. The Forest Service is very active in the area of recreation and wildlife preservation and presently administers a wildlife refuge in Illinois.

The U. S. Bureau of Sport Fisheries ar Wildlife operates the Tule Lake-Lower Klamath Wildlife Refuge complex, locati 15 to 25 airline miles from the center of Butte Valley. Since the proposed wildlife area is close to that complex the U. S. Bureau of Sport Fisheries ar Wildlife could be considered an appropriate agency for operation of the Bute Valley wildlife area. The experience f that agency in operating the Tule and Klamath Refuges should make it an effi cient operator of the Butte Valley wildlife area.

The California Department of Fish and Game presently operates six state wild life management areas. It also operats several federal wildlife refuges in California during the hunting season. As the state agency charged with responsibility for protecting and enhanc ing the wildlife resources in California, the Department of Fish and Game has the knowledge and experience needed to operate the proposed Butte Valley wildlife area. However, since Fish and Game receives no money from the State General Fund, the costs of project operation and maintenance woul have to come from hunting license fees and entrance fees on the refuge. Ther is some question whether sufficient money would be available to operate another area without additional fundin.

The decision on the desirability of project construction does not depend as much on which agency will operate or fund the project as on the attitude of the local people and conservation organizations toward the project. If they judge the project to be the best use of the land and deem the physical benefits to exceed the costs, then chances for construction of the project are good.

TABLE 5

POTENTIAL SOURCES OF FINANCIAL AID FOR WILDLIFE ENHANCEMENT

Program and Administering Agency	Purpose and Scope	General Information
	Federal Programs	
Federal Aid to Fish and Wildlife Restoration (Dingell-Johnson Act) (Pitman-Robertson Act) Bureau of Sport Fisheries and Wildlife	1. Research on fish and wildlife. 2. Improvement and development of habitat and facilities for fishing and hunting, largely by land acquisition. Federal aid up to 75% of project cost.	State Department of Fish and Game must act in the interest of local groups or for the State as a whole. Source of funds is excise tax on sporting goods.
Migratory Bird Hunting Stamp Act Bureau of Sport Fisheries and Wildlife	Acquisition and preservation of land for waterfowl habitat. With very high waterfowl potential can supply up to 100% of the cost of acquiring land.	Project must have a high potential for waterfowl habitat and be operated under the National Wildlife Refuge System.
Public Works and Economic Development Act of 1965, P. L. 89-136 Economic Development Administration	Grants for public works projects which stabilize or create new jobs or improve long-range economy. Up to 50% grants for eligible projects.	Recreation projects have received funds in the past.
Federal Revenue Sharing Treasury Department	No restrictions on use of money allocated to State. Local government use restricted to defined priority expenditures which include recreation.	$540,000 returned to California in calendar year 1972. Of this amount State received $180,000 and local governments received $360,000.
General Forest Service Appropriations	Wildlife habitat improvement on Forest Service lands.	Wetland wildlife area in Illinois has been funded and is now operating.

TABLE 5 (Continued)

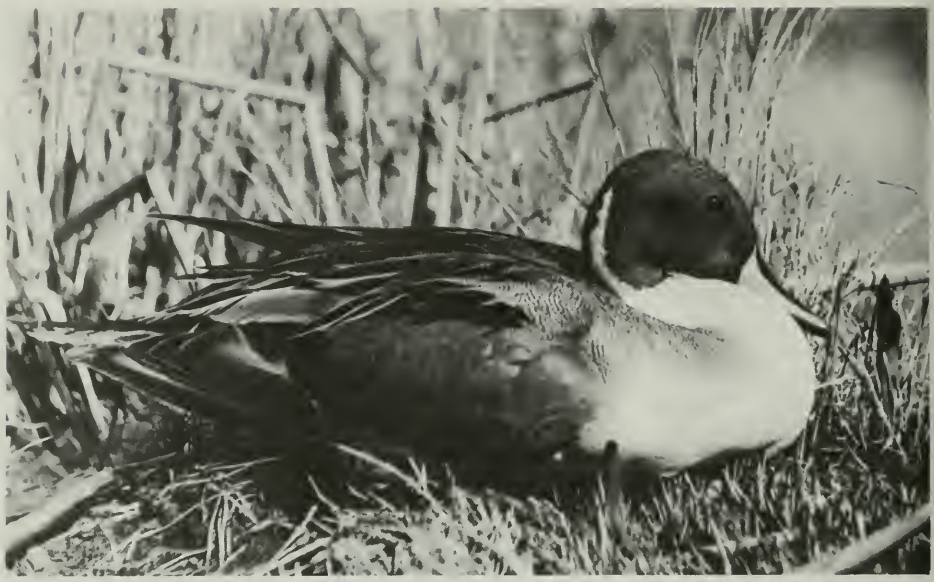
POTENTIAL SOURCES OF FINANCIAL AID FOR WILDLIFE ENHANCEMENT

Program and Administering Agency	Purpose and Scope	General Information
	State and County Programs	
Wildlife Conservation Law of 1947 Wildlife Conservation Board Department of Fish and Game	Capital outlay projects benefiting fish and wildlife. Projects such as habitat improvements or acquiring access rights qualify. No operation or maintenance cost paid.	Projects must have public access and high recreation potential and be clearly beneficial to fish and wildlife. Board can contribute 100% capital cost to eligible projects.
State Duck Stamp Act 1970 Department of Fish and Game	Wetlands acquisition in the State of California and Canada for enhancement of waterfowl.	1971 total revenues $178,000; 20% can be spent in California, 80% set aside for expenditure in Canada.
Environmental Protection Program Fund Resources and Business and Transportation Agencies Department of Motor Vehicles	Improved environmental quality through diverse programs such as ecological education, wild river protection, and acquisition of rare and endangered wildlife habitat.	Program funded by sale of personalized license plates. $595,000 appropriated to date for purchase of ecological reserves.
County Fine Money County Board of Supervisors	Any project benefiting fish and wildlife within a county. Up to 100% costs can be provided on approved projects.	Funds available are relatively small and vary between counties. Projects should have local support of sportsmen.

TABLE 5 (Continued)

POTENTIAL SOURCES OF FINANCIAL AID FOR WILDLIFE ENHANCEMENT

Program and Administering Agency	Purpose and Scope	General Information
Private Organizations Promoting Wildlife Preservation		
Ducks Unlimited Chicago, Illinois	Perpetuates wild waterfowl by preservation and rehabilitation of wetlands in United States and Canada. Assists and contributes to restoration and good management of waterfowl habitat.	Membership - 65,000.
National Audubon Society New York	Interested in and promotes public information on bird life and natural environments for wildlife. Operates several refuges and wildlife sanctuaries.	The society publishes monthly magazine, manuals, bulletins and teaching aids.
National Wildlife Federation Washington, D. C.	Dedicated to encouragement of wise use and management of national resources.	Publishes booklets, newsletters, and biomonthly magazine. Makes grants to graduate students.
Ford Foundation New York	Privately funded institution which supports research, training, and demonstration projects relating to improvement in environmental quality.	Provides grants to private and public bodies for projects which conform to and promote the foundation's objectives.



BIBLIOGRAPHY

1. California Department of Fish and Game. "California Fish and Wildlife Plan". Volumes I, II, and III. January 1966.

2. California Department of Public Works. Bulletin No. 21, "Irrigation Districts in California". 1929.

3. California Department of Water Resources. Bulletin No. 94-9, "Land and Water Use in Lost River-Butte Valley Hydrographic Unit". July 1965.

4. ----. Bulletin No. 83, "Klamath River Basin Investigation". July 1964.

5. California Division of Soil Conservation. "Butte Valley Watershed Project". July 1967.

6. U. S. Bureau of Reclamation. "Butte Division, Klamath Project Oregon-California". June 1960.

7. ----. "Upper Klamath River Basin, Reconnaissance Report". September 1971.

8. U. S. Department of the Interior. Geological Survey Water Supply Paper 1491. "Geology and Ground Water Features of the Butte Valley Region, Siskiyou County, California". 1960.

9. ----. "Waterfowl Tomorrow". 1964.

10. Utah Division of Fish and Game. "Water Requirements of Waterfowl Marshlands in Northern Utah". 1970.